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# ROAD RECONNAISSANCE REPORT

## IMPERIAL SAND DUNES RECREATION DEVELOPMENT

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PROJECT NO. 0612

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## FORWARD

This road reconnaissance report has been prepared to fulfill the management requirements identified in the Recreation Management Plan for the Imperial Sand Dunes Recreation Development.

In its recommended location, the road on the west side of the Dunes gives full consideration to the scenic values as well as planned access to camping areas, picnic areas, vista points, interpretative sites, way stations and administrative sites.

The material which follows was prepared jointly by Gilbert Hall of the Riverside District, Otto Kruger and Jim Nessen of the California State Office and Keith Chatterton and Lyle Heston of the Portland Service Center; and is a portion of a larger report that will establish criteria to develop the recreational potential and preserve the unique character of the Dunes.

Report Submitted By

James W. Nessen
Supervisory Civil Engineer

Reviewed By

D. D. Vail
District Manager, Riverside
District and Land Office

Approved By

J. R. Penny
Director, State of California

Prepared April 1972

Revised May 1972

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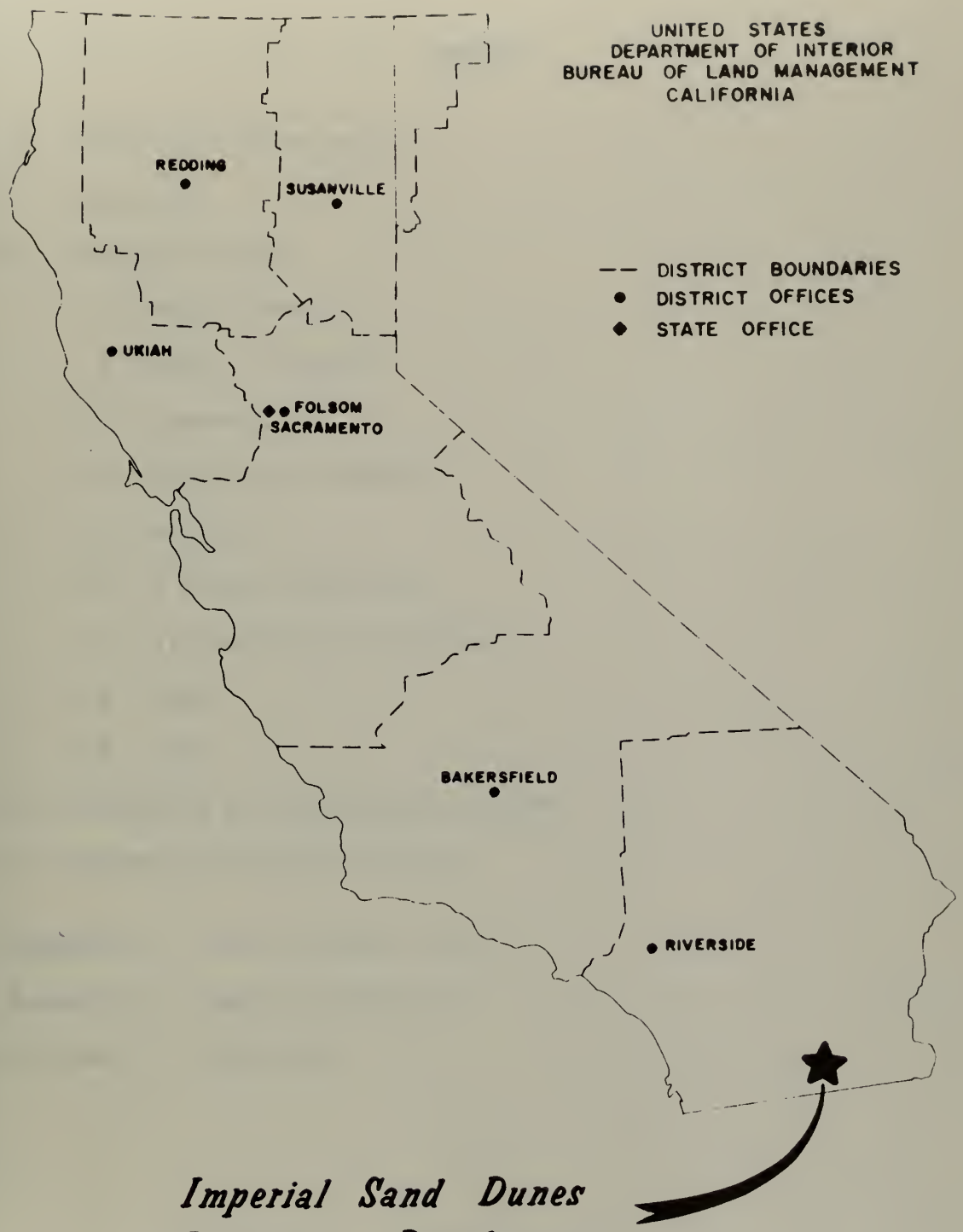
UNITED STATES
DEPARTMENT OF INTERIOR
BUREAU OF LAND MANAGEMENT
CALIFORNIA
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RIVERSIDE
Imperial Sand Dunes
Recreation Development

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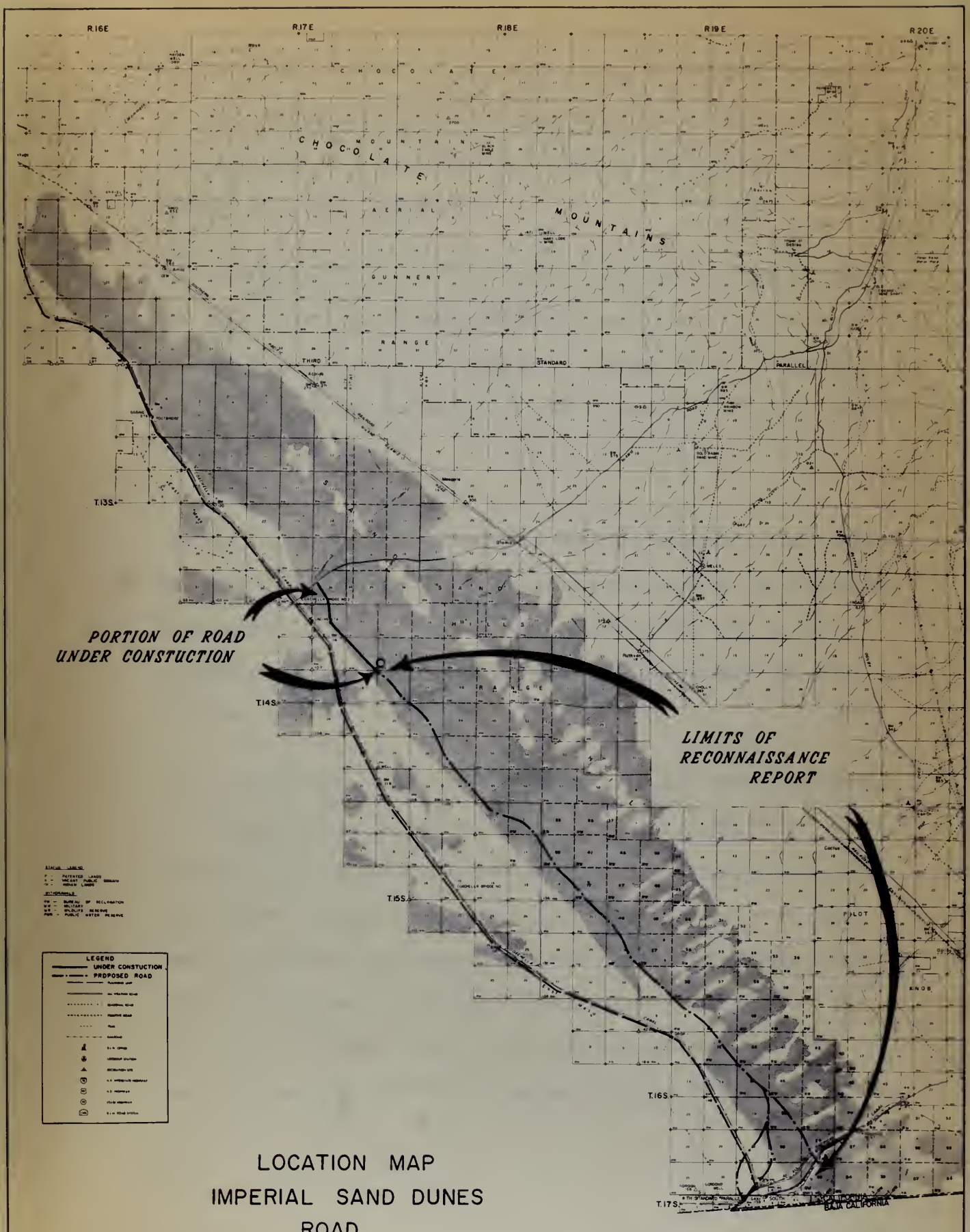
## 1.0 Objectives Of The Study

1. Investigate for management's review a planned, safe and esthetically attractive route for a scenic access road on the west side of the Imperial Sand Dunes from State Route 78 to Interstate 8.
2. Establish road criteria in the form of guidelines that will permit imagination, new ideas and techniques on the part of the professional designer and not reduce his role to that of a technician.
3. Identify the limits of low level photography by limiting the route corridor to enable the road to be designed from topographic maps prepared from aerial photography.
4. Provide sufficient data that, along with management's recommendations, the project could be given to a professional designer, either in-house or A&E contract, for preparation of plans and specifications.

## 2.0 The Area

The lands involved in the recreation development are the Imperial Sand Dunes which have often been called the "American Sahara Desert." They are located in Imperial County in southern California approximately 50 miles from the Colorado River and extend into northern Mexico. The wind-formed sand tract stretches more than 40 miles southeast of the Salton Sea and varies in width from 3 to 6 miles. The "Dunes", unlike other American deserts, are composed of huge masses of loose granular sand and extend 20 to 300 feet above the flat and surrounding desert lands.




# LOCATION MAP
# IMPERIAL SAND DUNES
# ROAD

Probably one of the most unique of its many outstanding features is its accessibility from large population areas. The outdoor recreationists with their off-road vehicles enjoy the spectacular terrain and scenic attractions.

The temperature in the area is one of the hottest within California; 100 degree days are expected 100 days a year. Winter temperatures average in the high 60's with lows in the high 30's. The annual precipitation is approximately 2½" and is one of the driest areas of the United States.

## 3.0 Design Criteria

The primary scenic access road will have the greatest visual impact and user influence of all the man-made facilities in the recreation development. For this reason, certain parameters must be established to insure a well coordinated effort to satisfy the basic criteria.

This road, linking I-78 with I-8, might be considered the backbone of the westside recreation development. It stretches forth like a giant ribbon as its transports users to the various developments or provides a dramatic exposure to the leisure driver. On the basis of physical requirements the road system will impose a pattern upon the landscape that is not generally consistent with the natural scene. Since paving colors are generally not harmonious with desert tones, this road will be emphasized by a distinct color contrast.

The designer must utilize all of his ability to minimize these effects. A basic corridor has been established to carry vehicular traffic in an efficient, generally pleasing manner. Within this corridor, however, extreme care must be exercised to keep the road character within the realm of a scenic recreation route. This will be most effectively accomplished if a rather fluid alignment is maintained within the corridor. This will keep to a minimum the long, unnatural tangents resulting in a detraction from the unique sandscape. By carefully planning the route, it will be possible to utilize land forms for screening man-made objects from view.

Minimal disturbance to the established character of the dunes must be foremost in the mind of the designer as he pursues this project.

3.1 General Criteria

The following data is presented to guide the designer in establishing the limiting criteria of the project. It should be noted that, due to the character of the traffic (seasonal high volumes), the DHV is a higher percentage of the ADT than is normally encountered.

ADT 1970 200 VPD

1990 350 VPD

DHV - 30 HV 1990 225 VPH

D = 80% T = 1%

Design Speed 50 MPH

Average Running Speed 40 MPH

Highway and Structural Loading H 20 - 216

Minimum Sight Distance - 350'

## 3.2 Safety in Passing

Due to the relatively high ratio of DHV to ADP, and the type of traffic anticipated, a positive and safe means of passing must be provided. With the specified scenic curvilinear horizontal and vertical alinement, it may be difficult to provide sufficient (1700') safe passing on the two-lane road.

In order to maintain both the curvinilear alinement and required safety in passing, the designer may select a divided four-lane road. If used, the divided lanes should have natural screening, variable median widths, and separate profiles and horizontal alinements.

As a minimum, provision for safe passing of 10 vehicles should be provided between each entrance to an overnight-use area and termini of the road.

## 3.3 Alinement

Generally the road alinement should be safe, easy riding, pleasing to observe and blend into the natural terrain. Both the horizontal and vertical alinements should complement each other. Horizontal curvatures where superimposed over the vertical alinement should be smooth. Sharp, horizontal curves should not be introduced at or near the top of pronounced crest vertical curves.

Horizontal alinement should be as directional as possible conforming to the topography. Flat curves are preferable to curves of maximum degree ($7^{o}$ for design speeds of 50 mph). The length of

curves should be as long as practical (500' minimum, if possible) and avoid any kinks or design inconsistencies. Tangents should be less than 1,000' in length and lead into and from with flat curve.

The vertical alinement should be gradual and flow above the natural contours. Roller-coaster or hidden-dip profile should be avoided. Maximum permissible grade is 6% with grades of 4% preferable. Minimum length of vertical curves for sag curves shall be 200' per % of charge. This is greater than the minimum allowed for a speed of 50 mph but is established to prevent sand from being deposited in the sags. Crest curves will be governed by safe distances and good design practices.

3.4 Cross Section Elements

The basic road section shall consist of 2" AC over a 6" base of 8% soil cement or 6% asphalt emulsion. Roadway width shall be 2 - 12' lanes and 4' shoulders all having a cross slope of .02 ft. per ft. on tangent sections. Beyond the shoulder will be a 12' section of 6:1 slope; any fill sections beyond that point shall be 4:1. This basic section along with a super elevation table is included in the Appendix "A", Sheet A-1.

In order to accommodate slower traffic on the roadway surface, the maximum super-elevation is restricted to .06 ft. per ft; this has resulted in reducing the largest size horizontal curve from the normal 8.5° for a 50 mph curve to 7°.

It is anticipated that the normal roadway will be built above the existing ground line. Adjacent ground of higher elevations will

be restricted to be 90' beyond the roadway centerline.

3.5 Materials

Materials used to construct the embankments shall consist of sandy material found locally in the area. Borrow areas shall be located in places of sparse vegetation and out of view from the road. Areas shall be irregular in shape and relatively shallow in depth. Final shaping to resemble the existing craters and depressions in the area will be by dragging with a dozer and final shaping by the wind. Access to the area should be by defined haul roads which limit the damage to the existing vegetation.

3.6 Grade Intersections

A Grade Intersection shall be provided for all intersections between the main road and spur roads to overnight-use areas, day-use areas, vistas, administrative sites and interpretative sites. A typical intersection is located in the Appendix "A", Sheet A-2.

3.7 Off Road Vehicle Crossings

Off road vehicle crossings shall be provided at designated points along the road to assist in managing the area. A typical detail is included in the Appendix "A", Sheet A-2, and the locations will be marked on the review copy of the preliminary Riverside District personnel.

3.8 Signs

Signs and other related markings shall be included as part of the road design and the designer should refer to the Manual on Uniform

Traffic Control Devices and the BLM Sign Handbook for guidance. A drawing on Typical Sign Installations is included in the Appendix "A", Sheet A-3.

3.9 Gates

Gates shall be designed and installed at strategic points along the road to assist in the management of the area. Gate locations will be furnished by the Riverside District personnel at the time they are reviewing the preliminary plans. Typical details of gate installations are furnished in the Appendix A, Sheet A-4.

## 4.0 Discussion of Reconnaissance Routes

From a pre-preliminary review, there are three basic possible locations for the access road. One is the flats between the Coachella Canal and the first ridge; the second on the first ridge east of the Coachella Canal; and the third in the low valley between the western ridge and the general dunes.

The road on the flats would be a natural for turnpike construction, long tangents, flat grades, and high speeds. It would offer little in the way of scenic values and is located on a desert surface that, once disturbed, would create excessive dust. This location is discounted since it does not comply with the basic criteria for a scenic road and provide suitable access to the camping areas.

The second possible location on the first ridge would offer a slightly curvilinear alignment, rolling grades, and the opportunity to view the surrounding terrain, and develop scenic overlooks. It would, however, not be in the best location to serve the ultimate recreation potential of the area.

The third possible location in the valley between the western ridge and the general dunes offers the greatest opportunity to locate a scenic road and also serve as access to the camping areas. It does, however, have some disadvantages, being, mainly, higher construction and maintenance costs and lack of isolation or privacy to some of the camping areas.

The recommended route is a combination of the ridge and valley locations with rolling grades and curvilinear alignment. It provides numerous possibilities for both sightseeing and access. For the sightseer, the location provides for small rest and picnic areas, vistas for brief stops to view the scenery, and several miles of ridge top location to exploit the massive and dynamic formations of the dunes and several miles of valley driving that lay within the dunes. For the off road vehicle user, it offers safe and rapid access to developed camping areas, yet provides isolation and privacy.

Maintenance on the recommended route will be much higher than normally anticipated on BLM roads and may entail some equipment on an experimental basis to evaluate the most economical and satisfactory manner to cope with any difficulties.

Following is a more detailed discussion of the recommended route which could more easily be understood by referring to the plan and profile drawings in the Appendix B, Sheets B-1 thru B-8.

The route will start at Station 175+00, which is the termini of the road currently under construction, and end with an intersection with Interstate 8. For the purpose of clarity only, the route nearest the Coachella

Canal on the P&P drawings is referred to as the Main Reconnaissance Line and does not reflect that it is the preferred route.

From Station 175 to Station 210, the route continues on the outside of the westernly row of dunes. At Station 210, the road can either enter into the inside of the dunes for a much more scenic route or remain on the main reconnaissance line. The route on the interior is referred to as Line A and Line B; these routes offer to the traveling tourist his first experience to enter within the dunes and become a part of their environment.

At Station 315, all studies routes would again intersect and join on the outside of the dunes. The primary purpose of extending the route on the outside near the top of the ridge is to permit isolation between the road and Road Runner overnight use area and provide an elevated view of the dunes and surrounding desert.

Between the Stations 315 and 485, where the route enters within the valley floor, several locations for vista points are available.

From Station 485 to 925 the route remains within the valley floor and winds from side to side exposing scenic views, providing an enclosed experience, and giving access to preselected points.

From Station 925 to Station 1050, the route can either be within the dunes or come outside and be near the top of the ridge. Both routes have scenic attractions and seem practical. From Station 1050 to Station 1130, the route is on the outside near the top of the ridge.

From Station 1130 to the Interstate, three proposed access routes are being considered, each of which is briefly described as follows:

1. The Main Reconnaissance Route is a traverse from Station 1130 to the existing Gordons Well Interchange. This route consists of long sweeeping curves over the flats, a bridge over the Coachella Canal, crosses some private land, and has a smooth transition to the existing interchange.

2. Alternate Route "J" is a traverse from Station 1130 to the existing Gordons Well Interchange. This route consists of long sweeping curves over the flats, a bridge over the Coachella Canal, and a connection to the existing frontage road. No private lands are involved, but the transition into the existing interchange is abrupt.

3. Alternate Route "H" is a traverse from Station 1130 to a proposed interchange at Grays Wells. This route consists of curvilinear alignment along the outer ridge and valley, a bridge over the All American Canal, and a new interchange at Grays Wells which will be finished by other agencies.

From the preliminary reconnaissance studies, the route to Grays Wells offers the best utilization of the lands and facilities planned for the southern termini of the recreation development.

Shorter access is provided to the flat proposed for the Way Station and rest area and the location of the control station is such that natural barriers could exist between fee and free areas.

It is, however, felt that the location of the final route be dependent upon the facilities to be served rather than have the facilities dependent upon the location of the road.

## 5.0 Estimated Construction Cost

An analysis of the bid tabulation for the portion of the road under construction (Stations 0+00 to 175+00) was used as a basis to prepare the estimate. The average figure of $65,000 per mile was added to $25,000 per mile for 2" of asphaltic concrete; this gives a total estimated cost per mile of $90,000. An ENR Construction Cost Index of 1655 should be used as a basis for revising the cost estimate.

| | | |
|---|---|---|
| Stations 0+00 to 175+00 (2" A.C. only) | | $ 82,800 |
| " 175+00 to *1130+00 | | $2,016,000 |

* Station 1130+00 selected as control point to study alternate routes to Interstate 8

Station 1130+00 to Gordons Wells on
Main Reconnaissance Route

| | | |
|---|---|---|
| Road - 2.6 Mi @ 90,000/Mi | = 234,000 | |
| R/W - 0.6 Mi | = 16,000 | |
| Bridge over Coachella | = 100,000 | |
| | $350,000 | $ 350,000 |

Station 1130+00 to Gordons Wells on
Alternate Route "J"

| | | |
|---|---|---|
| Road - 2.5 Mi @ 90,000/Mi | = 225,000 | |
| Bridge over Coachella | = 100,000 | |
| | $325,000 | $ 325,000 |

| | | |
|---|---|---|
| Station 1130+00 to Proposed New Interchange on Alternate Route "H" | | |
| Road - 2.3 Mi @ 90,000/Mi | = 210,000 | |
| Bridge over All American | = 350,000 | |
| Interchange** | = 600,000 | |
| | $1,160,000 | $1,160,000 |

** Interchange from funds other than BLM

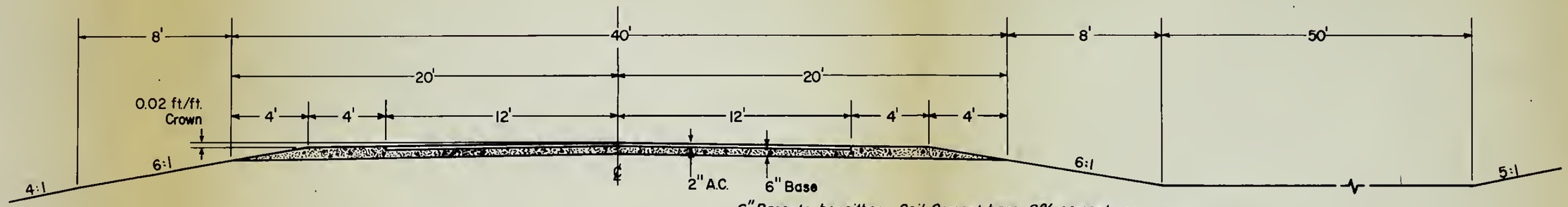
## APPENDIX A - TYPICAL DESIGN DETAILS

Sheet A-1 Typical Cross Section and Superelevation Table

Sheet A-2 Details "At Grade Intersection and ORV Crossing"

Sheet A-3 Typical Sign Installation

Sheet A-4 Typical Gate Detail




*6" Base to be either - Soil Cement base, 8% cement, or*
*- Emulsion treated base, 6% asphalt emulsion.*

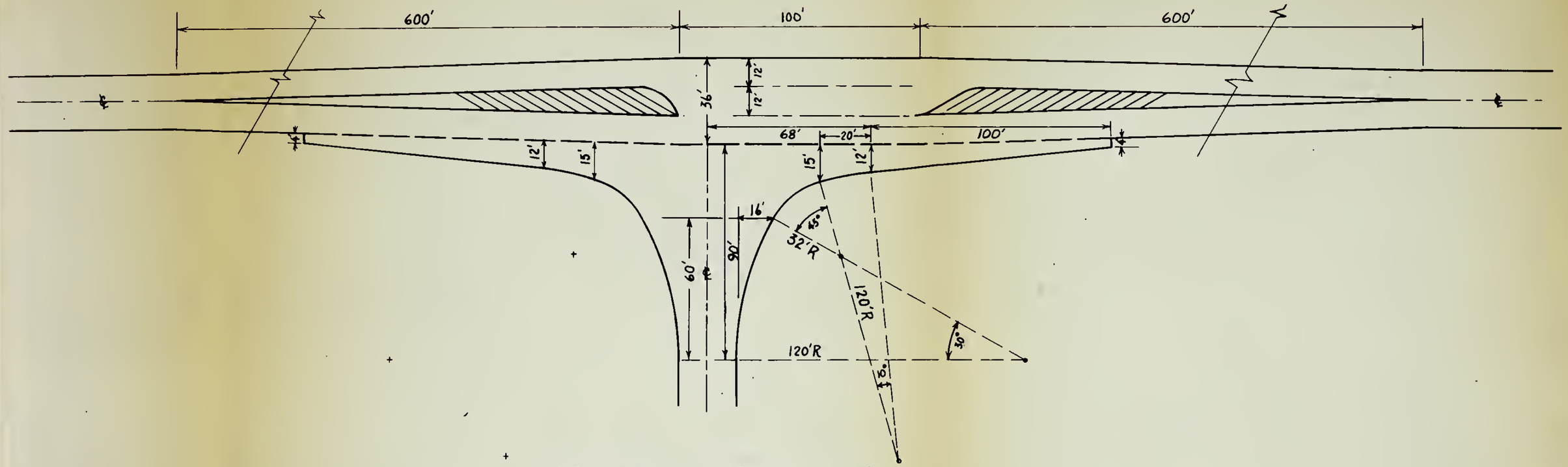
## 24' ROAD WITH DITCH

### SUPERELEVATION

| Degree of Curve | Radius | Rate of Superelevation | Transition Length |
|---|---|---|---|
| 0° 15' | 22918' | N.C. | 0 |
| 0° 30' | 11459' | R.C. | 150 |
| 0° 45' | 7639' | R.C. | 150 |
| 1° 00' | 5730' | .018 | 150 |
| 1° 30' | 3820' | .025 | 150 |
| 2° 00' | 2865' | .031 | 150 |
| 2° 30' | 2292' | 037 | 150 |
| 3° 00' | 1910' | .042 | 150 |
| 3° 30' | 1637' | .046 | 150 |
| 4° 00' | 1432' | .050 | 150 |
| 5° 00' | 1146' | .056 | 150 |
| 6° 00' | 995' | .059 | 150 |
| 7° 00' | 819' | .060 | 150 |

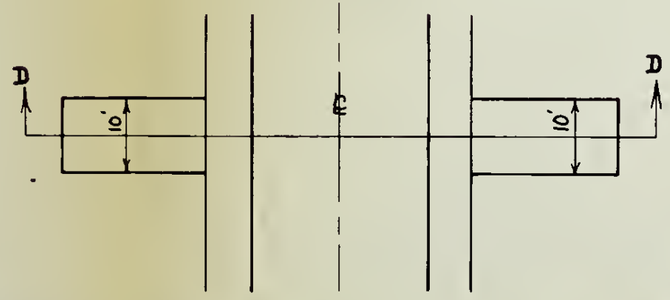
## TYPICAL CROSS SECTION AND SUPERELEVATION TABLE

DESIGNED - J. Nessen – O. Kruger
DRAWN - E. Ralston
CHECKED
SCALE - 3/16" = 1'-0"
DATE - 31 March 1972

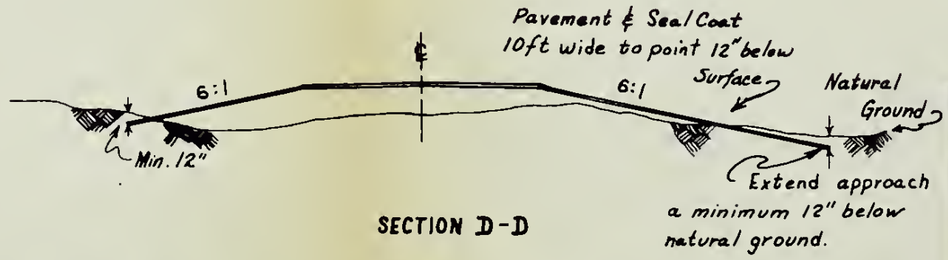



AT GRADE INTERSECTION

SCALE 1"=40'




OFF-ROAD VEHICLE CROSSING
SCALE 1"= 20'




SECTION D-D

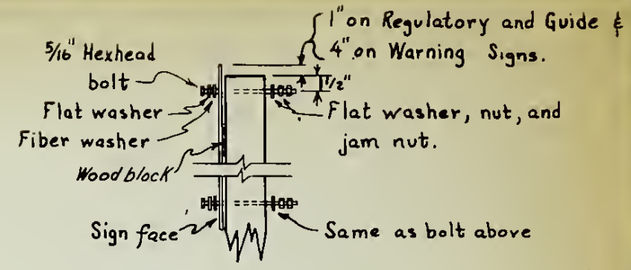
— Symbol on Plan & Profile sheets for Off-Road Vehicle Crossings

U. S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

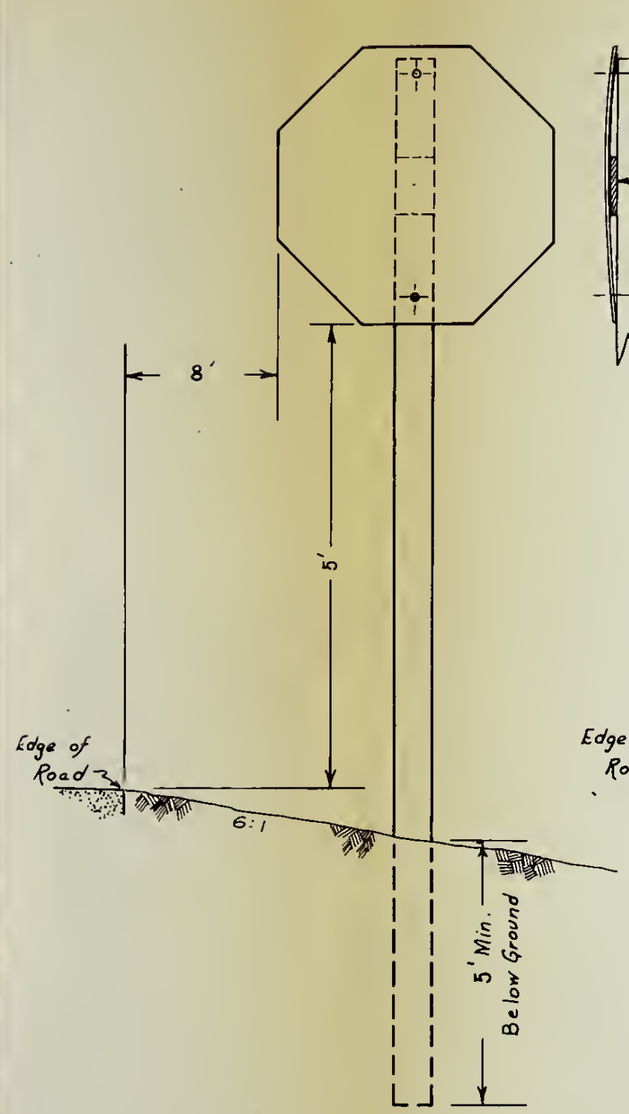
DETAILS
AT GRADE INTERSECTION
and O.R.V. CROSSING

| | |
|---|---|
| DESIGNED O.T.K. | RECOMM. |
| DRAWN C.D.S. | RECOMM. CHIEF, OF ENG. |
| CHECKED | APPROVED |
| SCALE | |
| DATE 10-4-71 | SHEET OF |
| DRAWING NO. | |

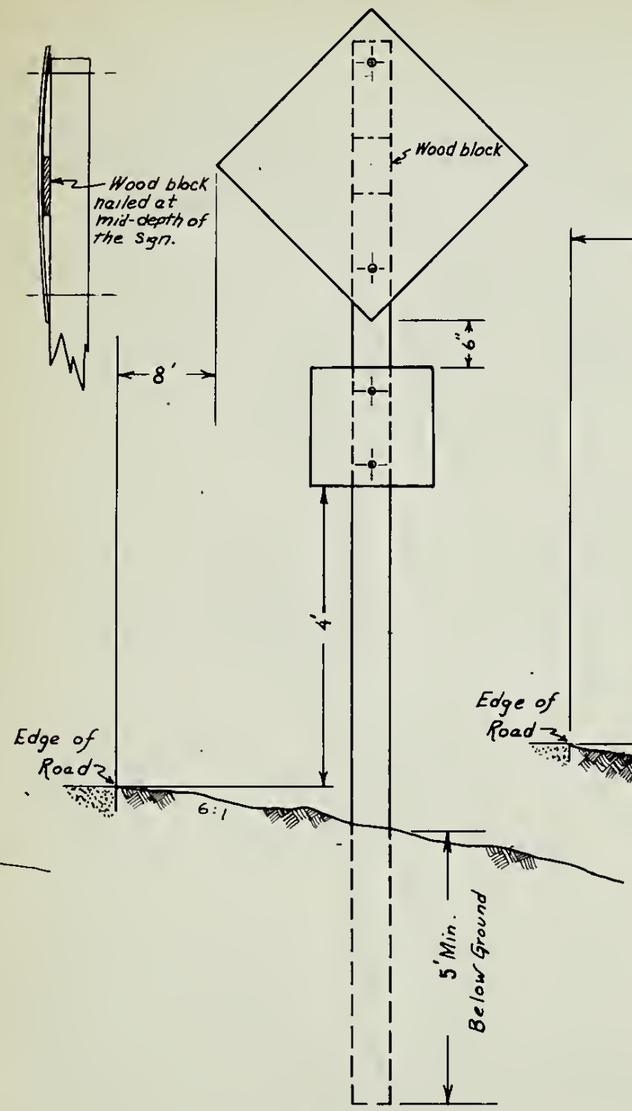
Wood Block - 1"x4"x0'-6" for 24"x36" Width signs
1½"x4"x0'-6" for 37"x54" " "
} 18" or more in depth.
No blocks on signs less than 18" in depth.



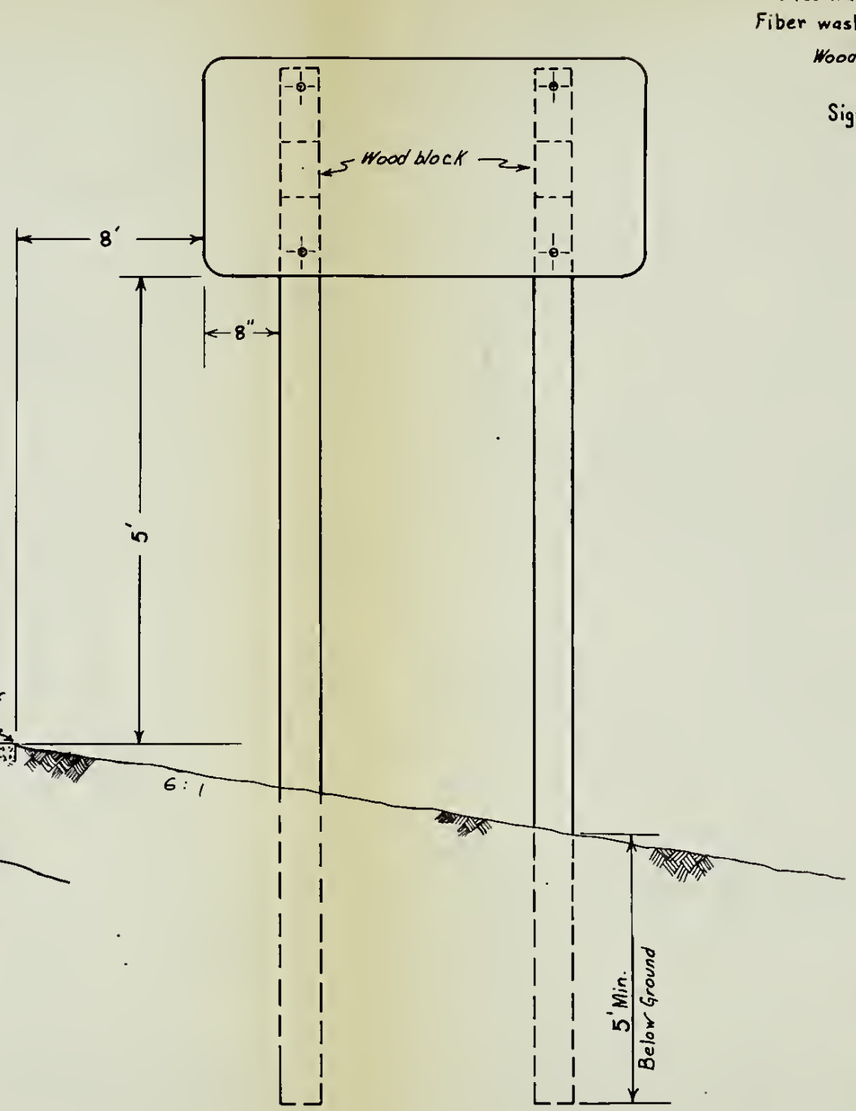

FASTENING DETAIL




#1
INSTALLATION FOR:
REGULATORY, WARNING & GUIDE SIGNS
(Regulatory sign shown)




#2
INSTALLATION FOR:
WARNING SIGNS WITH ADVISORY PLATE




#3
INSTALLATION FOR:
GUIDE SIGNS
(48" And Larger)

NOTE:

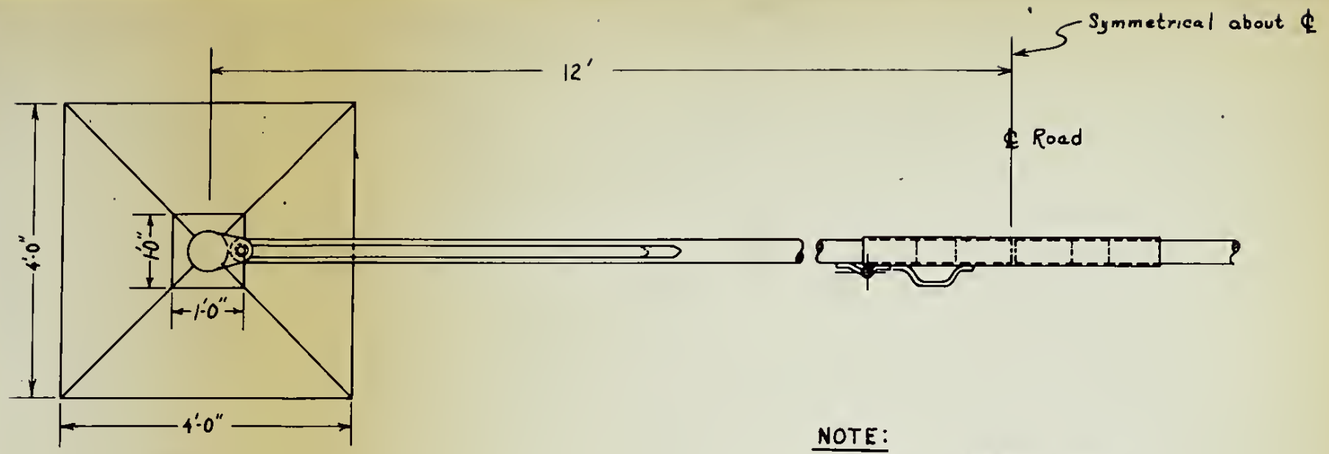
1. Installation includes furnishing of 4"x 4" posts and necessary hardware - see Plan for Type and location of Signs. ▲- location symbol

2. Paint - Posts shall be treated with one coat of BEHR Process Corporation - Rawhide Plus 10 - Tinted color, Mojave Sand - Or equal.

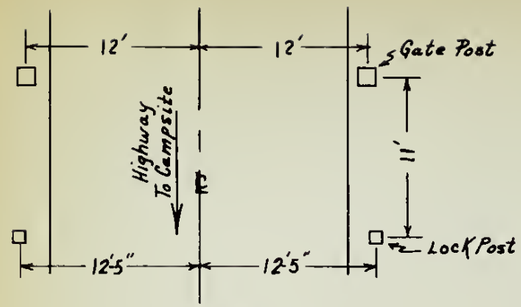
U. S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

# TYPICAL SIGN INSTALLATION

| | |
|---|---|
| DESIGNED | RECOMM. |
| DRAWN CDS | RECOMM. CHIEF, BR. OF ENG. |
| CHECKED OTK | APPROVED CHIEF, DIV. TECH. SER. |
| SCALE No Scale | |
| DATE 10-4-71 | SHEET OF |
| DRAWING NO. | |

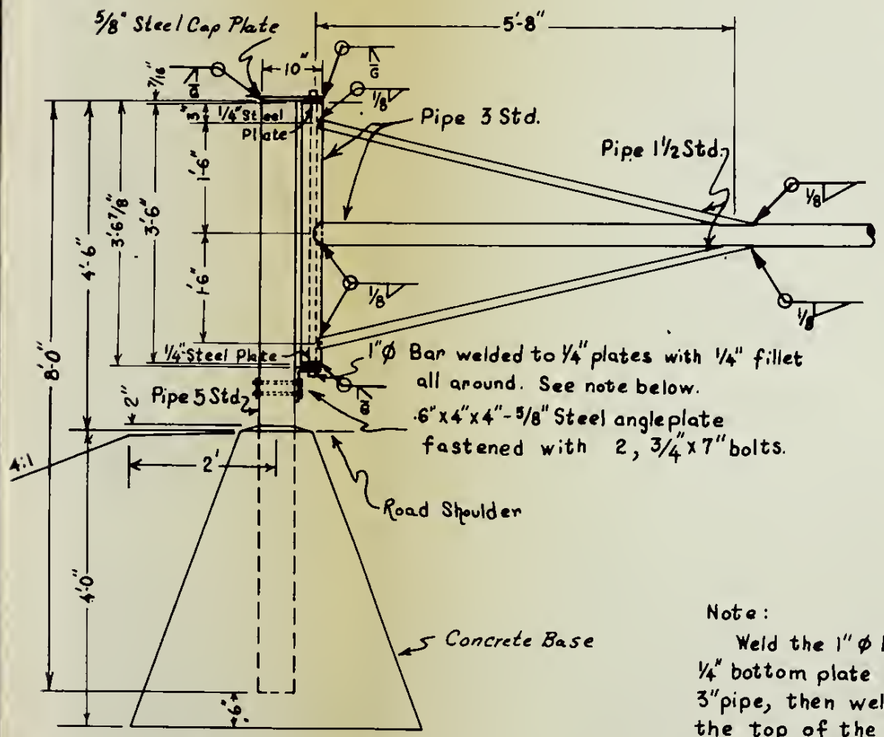



PLAN



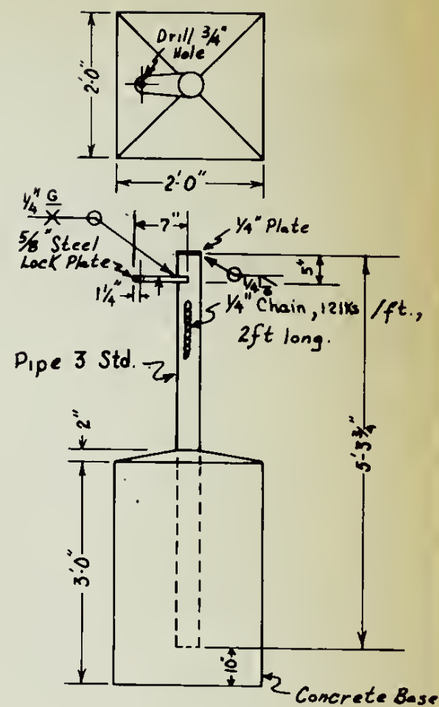

PLACEMENT DIAGRAM
No Scale

NOTE:
Gates installed at entrance to camp sites as shown on plan and profile sheets.
Two gates installed equal distance from the ℄ of the road with one locking sleeve, at each location shown on the plan.
One lock post / gate.
All structural steel shall conform to ASTM A 53
All bolts shall conform to ASTM A 307

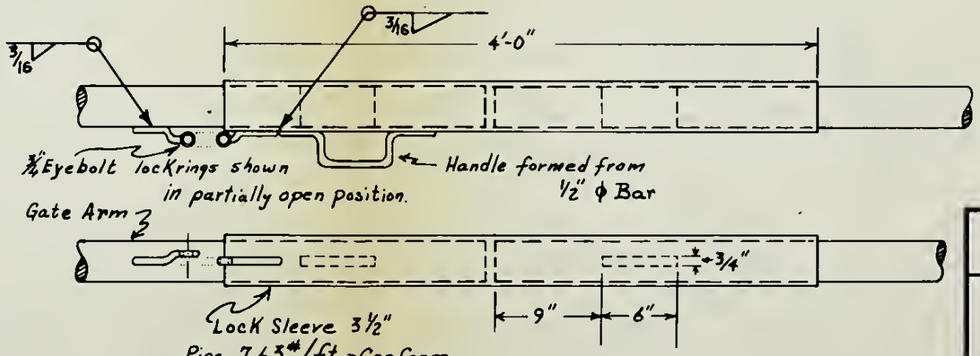



ELEVATION
GATE DETAIL
Scale ½" = 1'

Note:
Weld the 1" ℄ bar to the top of ¼" bottom plate before installing 3" pipe, then weld the 1" ℄ bar to the top of the top ¼" plate. Add 3" ℄ x 3/8" plate washer with 1¼" ℄ hole, above top ¼" plate and below bottom ¼" plate.




LOCK POST
Scale ½" = 1'




Pipe 7.63#/ft. - Conform to ASTM A 501. Available from U.S Steel.

LOCK SLEEVE DETAIL
Scale 1" = 1'

U. S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

# TYPICAL GATE DETAIL

| | |
|---|---|
| DESIGNED OTK | RECOMM. |
| DRAWN CDS | RECOMM. CHIEF, BR. OF ENG. |
| CHECKED OTK | APPROVED CHIEF, DIV. TECH. SERV. |
| SCALE AS Shown | |
| DATE | SHEET ___ OF ___ |
| DRAWING NO. | |

# APPENDIX B - ROUTE RECONNAISSANCE

Sheet B-1 Station 175+00 to 335+00

Sheet B-2 Station 335+00 to 495+00

Sheet B-3 Station 495+00 to 655+00

Sheet B-4 Station 650+00 to 810+00

Sheet B-5 Station 785+00 to 940+00

Sheet B-6 Station 940+00 to 1100+00

Sheet B-7 Station 1100+00 to "H" Line 100+00

Sheet B-8 Station 1120+00 to 1275+00

ROUTE LOCATED IN OFFICE - J. NESSEN, O. KRUGER
PLOTTED - J. NESSEN, O. KRUGER, E. RALSTON
ROUTE REVIEWED IN FIELD - J. NESSEN, G. HALL, L. HESTON, K. CHATTERTON

END OF CONST. CONTRACT FY 72
BEGINNING OF RECON. SURVEY

"A" LINE

"B" LINE

MAIN RECONNAISSANCE LINE

PROVIDE ACCESS TO DAY USE AREA

DAY USE AREA

PROVISION FOR PASSING THIS AREA

SCENIC VIEW

LOCAL ROAD RUNNING SOUTH

MAXIMUM CURVE PERMISSABLE

350 ft
SAFE STOPPING SIGHT DISTANCE

1700 ft
SAFE PASSING SIGHT DISTANCE

LIMITS OF 2 FOOT CONTOUR MAP FROM LOW LEVEL PHOTOGRAPHY

SCALE
0 500 1000 1500
FEET

TYPICAL GRADES
6% MAX
4%
2%
PREFERRED

"B" LINE (PASSING LANE)

"A" LINE (ALTERNATE ROUTE)

MAIN RECONNAISSANCE LINE

PROFILE
HORIZ 1000'
VERT 100'

ROUTE LOCATED IN OFFICE - J NESSEN, O KRUGER
ROUTE REVIEWED IN FIELD - J NESSEN, O KRUGER, E RALSTON
PLOTTED - J NESSEN, G HALL, L HESTON, K CHATTERTON

MAXIMUM CURVE PERMISSABLE

360 ft
SAFE STOPPING SIGHT DISTANCE

1700 ft
SAFE PASSING SIGHT DISTANCE

LIMITS OF 2 FOOT CONTOUR MAP FROM LOW LEVEL PHOTOGRAPHY

SCALE
0 500 1000 1500
FEET

SCENIC VIEW

SCENIC VIEW

ACCESS TO ROADRUNNER AREA

ACCESS TO ROADRUNNER AREA

POSSIBLE VISTA AREA

POSSIBLE VISTA AREA

MAIN RECONNAISSANCE LINE

PROVIDE FOR SAFE PASSING THIS AREA

6% MAXIMUM
4%
2%
PREFERRED
TYPICAL GRADES

PROFILE
HOR. SCALE
VER.

300
250

MAIN RECONNAISSANCE LINE

ROUTE LOCATED IN OFFICE - J NESSEN, O KRUGER
PLOTTED - J NESSEN, O KRUGER, E RALSTON
ROUTE REVIEWED IN FIELD - J NESSEN, G HALL, L HESTON, K CHATTERTON

N

"C" LINE

MAIN RECONNAISSANCE LINE

ACCESS TO ROADSIDE REST AREA

SCENIC VIEW

SCENIC VIEW

SCENIC VIEW

ACCESS FOR DAY USE AREA

MAXIMUM CURVE PERMISSABLE

350 ft
SAFE STOPPING SIGHT DISTANCE

1700 ft
SAFE PASSING SIGHT DISTANCE

LIMITS OF 2 FOOT CONTOUR MAP FROM LOW LEVEL PHOTOGRAPHY

SCALE
0 500 1000 1500
FEET

PROFILE
DRAWN
TRACED
CHECKED
NOTE BOOK
NO

6% MAXIMUM
4% PREFERRED
2%
TYPICAL GRADES

"C" LINE (PASSING LANE)

MAIN RECONNAISSANCE LINE

ROUTE LOCATED IN OFFICE - J NESSEN, O KRUGER
PLOTTED - J NESSEN, O KRUGER, E. RALSTON
ROUTE REVIEWED IN FIELD - J NESSEN, G HALL, L HESTON, K CHATTERTON

MAXIMUM CURVE PERMISSABLE

350 ft
SAFE STOPPING SIGHT DISTANCE

1700 ft
SAFE PASSING SIGHT DISTANCE

LIMITS OF 2 FOOT CONTOUR MAP FROM LOW LEVEL PHOTOGRAPHY

SCALE
0 500 1000 1500
FEET

ACCESS TO POCKET AREA

SCENIC VIEW

MAIN RECONNAISSANCE LINE

SEE SHEET No 5 FOR CONTINUATION OF D LINE

PROVIDE ACCESS TO VISTA

6% MAXIMUM
PREFERRED
TYPICAL GRADES

PROFILE
HORIZ SCALE
VERT

300
250
200

650+00 655 660 665 670 675+00 680 685 690 695 700+00 705 710 715 720 725+00 730 735 740 745 750+00 755 760 765 770 775+00 780 785 790 795 800+00 805 810

MAIN RECONNAISSANCE LINE

ROUTE LOCATED IN OFFICE - J NESSEN, O KRUGER
PLOTTED - J NESSEN, O KRUGER, E RALSTON
ROUTE REVIEWED IN FIELD - J NESSEN, G HALL, L HESTON, K CHATTERTON

205311
243 32

N

SCENIC VIEW AT HIGH DUNES

SCENIC VIEW

SCENIC VIEW

SCENIC VIEW

"D" LINE

"E" LINE

MAIN RECONNAISSANCE LINE

ROAD TO RIVERWATCH SITE

POSSIBLE BREAKS THROUGH DUNES

MAXIMUM CURVE PERMISSABLE

360 ft
SAFE STOPPING SIGHT DISTANCE

1700 ft
SAFE PASSING SIGHT DISTANCE

LIMITS OF 2 FOOT CONTOUR MAP FROM LOW LEVEL PHOTOGRAPH

SCALE
0 500 1000 1500
FEET

PROFILE NOTE BOOK NO

"E" LINE (ALTERNATE ROUTE)

"D" LINE (PASSING LANE)

MAIN RECONNAISSANCE LINE

nat. grd.

6% MAXIMUM
4%
2%
PREFERRED
TYPICAL GRADE

ROUTE LOCATED IN OFFICE - J NESSEN, O KRUGER
PLOTTED- J NESSEN, O KRUGER, E RALSTON
ROUTE REVIEWED IN FIELD- J NESSEN, G HALL, L HESTON, K CHATTERTON

PROFILE NOTE BOOK NO

MAXIMUM CURVE PERMISSABLE

350 ft
SAFE STOPPING SIGHT DISTANCE

1700 ft
SAFE PASSING SIGHT DISTANCE

LIMITS OF 2 FOOT CONTOUR MAP FROM LOW LEVEL PHOTOGRAPHY

SCALE
0 500 1000 1500
FEET

"F" LINE

"E" LINE

"G" LINE

SCENIC VIEW

SCENIC VIEW

ACCESS TO BADGER SITE

POSSIBLE ACCESS THROUGH DUNES

MAIN RECONNAISSANCE LINE

COACHELLA CANAL

204331
158 97

6% MAXIMUM
4% PREFERRED
2%
TYPICAL GRADES

"F" LINE (ALTERNATE PASSING LINE)

"E" LINE (ALTERNATE ROUTE)

"G" LINE (PASSING LANE)

MAIN RECONNAISSANCE LINE

ROUTE LOCATED IN OFFICE - J.NESSEN, O. KRUGER
PLOTTED - J.NESSEN, O. KRUGER, E. RALSTON
ROUTE REVIEWED IN FIELD - J.NESSEN, G. HALL, L. NESTOR, K. CHATTERTON

MAXIMUM CURVE PERMISSABLE

350 ft
SAFE STOPPING SIGHT DISTANCE

1700 ft
SAFE PASSING SIGHT DISTANCE

LIMITS OF 2 FOOT CONTOUR MAP FROM LOW LEVEL PHOTOGRAPHY

SCALE
0 500 1000 1500
FEET

N

"I" LINE

STA. 1130+00
CONTROL POINT

MAIN RECONNAISSANCE LINE

SEE SHEET 8 FOR ALTERNATE ROUTE

POSSIBLE SITE FOR WAY STATION

"H" LINE

POSSIBLE SITE FOR WAY STATION

ALL AMERICAN CANAL

PROFILE

"I" LINE (PASSING LANE)

6% MAXIMUM
4%
2%
PREFERRED
TYPICAL GRADE

MATCHING POINTS STA. 1148+00 = 0+00

MAIN RECONNAISSANCE LINE

"H" LINE (ALTERNATE ROUTE)

ALL AMERICAN CANAL

INTERSTATE 8

ROUTE LOCATED IN OFFICE - J NESSEN, O KRUGER
PLOTTED - J NESSEN, O KRUGER, E. RALSTON
ROUTE REVIEWED IN FIELD - J NESSEN, G HALL, L WESTON, K CHATTERTON

"J" LINE

MAIN RECONNAISSANCE LINE

SEE SHEET 7 FOR ALTERNATE ROUTES

COACHELLA CANAL

AMERICAN CANAL

MAXIMUM CURVE PERMISSABLE

300 ft
SAFE STOPPING SIGHT DISTANCE

1700 ft
SAFE PASSING SIGHT DISTANCE

LIMITS OF 8 FOOT CONTOUR MAP FROM LOW LEVEL PHOTOGRAPHY

SCALE
0 500 1000 1500
FEET

PROFILE

"J" LINE (ALTERNATE ROUTE)

MAIN RECONNAISSANCE LINE

Coachella Canal

Highway 99

6% MAXIMUM
4%
3%
PREFERRED

TYPICAL GRADE

## APPENDIX C - REFERENCES


1. Technical Report ETR-7700-2. Scenic Road, A Basis for its Planning, Design and Management. Forest Service, U.S. Dept. of Agriculture.

2. Standard Specification for Highway Bridges, 1969. American Association of State Highway Officials.

3. A Policy on Geometric Design of Rural Highways, 1965. American Association of State Highway Officials.

4. Manual - Scenic Roads and Parkway Studies. U. S. Department of Commerce, October 26, 1954.

5. Manual on Uniform Traffic Control Devices for Streets and Highways. U. S. Government Printing Office.

6. A Guide for Highway Landscape and Environmental Design, 1970. American Association of State Highway Officials.



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